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A CASE OF LATEROVERSION OF THE OPHIDIAN HEART.

By Pierre A. Fish.

The specimen had already been partially dissected by one of the laboratory students in the Anatomical Department (Cornell) before attention was called to the peculiar cardiac arrangement.

The body had been divested of its skin until within six centimeters of the vent and seven centimeters of the tip of the mandible; the cranium had been removed, leaving the mandible still attached to the body; the heart had been exposed and the ventral portion of the pericardial sac, if any had existed, was gone. A normal specimen was put into the hands of the student for further dissection and the anomalous one has awaited careful examination since 1891.

Enough characters remained to enable one to identify it with a reasonable amount of certainty as *Ophibolus doliatus* var. *triangulus* or as commonly known, the spotted adder or milk snake.

Its total length was 85 centimeters (2 feet 10 inches); from the tip of the mandible to the apex of the heart the distance was 11 centimeters, the heart itself from the apex of the ventricle to the base of the right auricle being 1·8 centimeters.

The interior of the pericardium (already exposed) presented a somewhat cone-shaped cavity through the length of which, and a little to the right of the mid-line, the pulmonary and post caval veins passed. These did not lie freely in the sac but were held in place by a narrow, but distinct fold projecting from the dorsal wall of the pericardium.

A considerable depression for the reception of the ventricle was formed just cephalad of the auricles by a sinistral deflection of the trachea and œsophagus; the trachea also showed signs of compression on the side adjacent to the heart. No trace of a true pericardium was apparent here, but there seemed to be a somewhat excessive development of connective tissue.

Aside from the very peculiar position of the ventricle, one of the most striking features was the unusual engorgement of the vessels of the left side with blood, in the immediate proximity of the heart. The left auricle also presented this feature while the right was comparatively empty.

A superficial examination of the conditions seemed to show that there had been a complete ante-version of the whole heart, the ventral surface becoming dorsal and the dorsal ventral. On carefully removing the dense connective tissue covering the surface of the ventricle, this conclusion was shown to be erroneous from the fact that the aortic arches were found to arise from this apparent, and at the same time real ventral aspect. This as well as some theoretical reasons would demonstrate quite effectively that true ante-version could not have occurred.

What appears to be the most logical inference, and dissection seems to confirm it, is that rotation must have taken place, the fixed point being at about the place of divergence of the two aortic arches; and since the apex of the ventricle points in a diametrically opposite direction to that found in the normal condition, it must therefore have passed from right to left and through an arc of 180°—provided the heart was ever normal. The apparent left side of the ventricle would then be the true morphological right side and *vice versa.*

The auricles would naturally tend to follow the ventricle in this rotation, but there is no very marked displacement of their relations to each other. This does not hold true with regard to the ventricle in its new location, for the apparent right, but really the morphologically left side is in a line with the right auricle and the morphological right side is in a line with the left auricle.

An effectual restraint would be offered against this migratory tendency of the auricles, in the case of the right auricle by the pulmonary vein which would prevent its passing the mid-line. And similarly for the left auricle by the left aortic arch, which would prevent any movement of the auricle in a cephalic direction. The usual disproportion of size between the two auricles is not evident, though this may be accounted for by the collapsed condition of the right as compared with the left side. The ventricle if it has rotated must have passed along the ventral aspect of the left auricle.

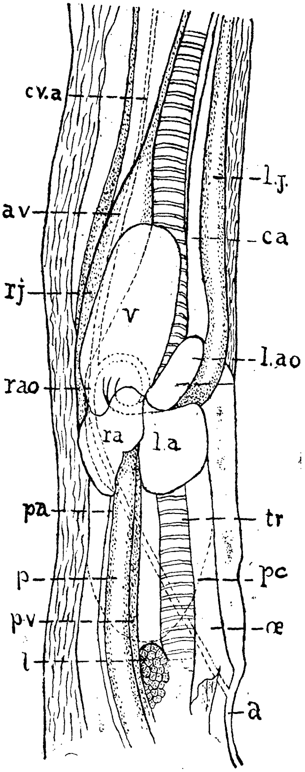
After a careful and completer dissection of the heart and the vessels adjacent to it so that the parts could be more easily manipulated, it was found that the ventricle could be returned to an approximately normal position which assisted quite materially in elucidating the relationship of the vessels to the heart and to each other.

The two aortas at their diverging point are twisted half around each other, the right in this case being smaller than the left and sending off only one branch—the cervical artery; the right aorta then passes dorsad of the trachea and œsophagus in an oblique caudal direction until it meets the left to form the common aorta.

The left aorta presents a peculiar enlargement shortly after emerging from its " twist, " due perhaps to over-distention with coagulated blood, and at the point of the greatest convexity of its curve it sends off the carotid artery and gradually diminishes in calibre until it meets its fellow. It would appear from this that the left aorta, instead of being a mere connecting branch as is usually the case, has assumed the chief function of the right, supplying the head with blood through the carotid. The two aortas retain their crossed origins at the ventricle as in normal specimens. It is not improbable that the right aorta suffers more by the twisting than does the left, causing a greater retardation of the flow of blood and thus offering a possible explanation for its diminished size and partial loss of function.

The right jugular vein was somewhat enlarged near the heart but empty and was partially compressed by the ventricle. At about the level of the auriculo-ventricular furrow it receives the (pre?) azygous vein and the common venous trunk, which is of smaller calibre than the jugular, then follows the dorsal contour of the right auricle, arching over to enter the sinus venosus at about the point of entrance of the postcava.

The position of the sinus which normally is perhaps more dorsal than lateral has, on account of the rotation, assumed a more nearly mesial and ventral location, thus bringing the postcava in line with the pulmonary vein to which it seemed to be quite closely adherent. The left jugular vein likewise presents a central enlargement and forms a sling-like support for the arch of the left aorta.



In the intricate and unusual arrangement of the parts here, the vein was inadvertently cut so that its course to the right auricle could not be satisfactorily determined.

The pulmonary vein passes from the lung through the pericardial cavity accompanied by the post-cava and passes between the two auricles more ventral than dorsal and enters the left auricle.

The significance of the central enlargements of the left aorta and the carotid artery and of the left and right jugular veins is not apparent, unless they may in some way be correlated with the anomalous position of the cardiac parts. These vessels nearer the heart are of smaller calibre, and on account of their twisted condition must retard the flow of blood considerably, the enlargements, then, may function as reservoirs for a reserve blood supply.

Such factors as gravity, pressure, mode and direction of progression would militate against the view of a post-natal development of this anomaly and would render more plausible the idea that it was due to some congenital or fortuitous embryonic condition.

The accompanying figure was traced from a photograph enlarged three diameters, the veins are shaded; the dotted lines indicate vessels that were too deep or insufficiently dissected to show at the time of photographing, and have been filled in freehand.

Specimens of *Eutænia sirtalis*, *Tropidonotus sipedon*, *Crotalus horridus*, and *Python molurus* were used for controls. Among them some interesting facts were observed which may serve as a basis for a future paper.

Reference letters. *a*, common aorta; *av*, azygus vein; *ca*, carotid artery; *cva*, cervical artery; *l*, lung; *la*, left auricle; *lao*, left aorta; *lj*, left jugular; *œ*, œsophagus; *p*, postcava; *pa*, pulmonary artery; *pc*, pericardium; *ra*, right auricle; *rao*, right aorta; *tr*, trachea; *v*, ventricle. Magnified 2 diameters.